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No. 433

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USSR AND EASTERN EUROPE SCIENTIFIC ABSTRACTS

GEOPHYSICS, ASTRONOMY AND SPACE

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This serial publication contains abstracts of articles and news items from USSR and Eastern Europe scientific and technical journals on the specific subjects reflected in the table of contents.

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I. METEOROLOGY

Abstracts of Scientific Articles

TOTAL DIURNAL RADIATION INFLUX OVER OCEANS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 242, No 4, 1978 pp 804-807

[Article by Corresponding Member USSR Academy of Sciences K. Ya. Kondrat'yev and M. A. Prokof'yev, Main Geophysical Observatory, "Experience in Determining the Total Diurnal Radiation Heat Influx Using GATE Data"]

[Abstract] On the basis of an analysis of data from shipboard, aircraft and radiosonde observations during the GATE period an attempt has been made to evaluate the total diurnal radiation heat influx to the layer of the tropical atmosphere to an altitude of about 6 km and its vertical distribution. Use was made of data from Soviet ships, the shipboard actinometric radiosonde observation system, and also the results of actinometric observations from aboard Soviet and American aircraft laboratories participating in GATE. The method described in the article was used in analyzing the results of the multiaircraft GATE operation of 30 July 1974: the results of computations of the long- and short-wave components of the diurnal radiation balance and also the diurnal radiation heat influxes to the sounded layers. In the near-midday hours there is a substantial excess of short-wave absorption over long-wave cooling up to the upper boundary of the aerosol layer. At the same time, in the diurnal radiation balance, as might be expected, long-range cooling exerts a predominant effect. The effect of the aerosol layer is expressed in the fact that the cooling maximum is situated near the level of the upper boundary of the aerosol layer and by an order of magnitude exceeds the short-wave absorption. Within the aerosol layer short-wave absorption and long-wave cooling are comparable, although as before in the diurnal balance the overall effect is cooling. The contribution of short-wave heat influx in the entire sounded layer of the atmosphere during a 24-hour period is about 23% of the long-wave cooling. In the aerosol layer (to an altitude of 4,550 m) it increases to 36%; in the lower 1.5 km it is already 60% of the long-wave cooling.
[36]

II. OCEANOGRAPHY

Abstracts of Scientific Articles

VARIABILITY OF TEMPERATURE FIELD IN COASTAL ZONE OF SEA

Moscow OKEANOLOGIYA in Russian Vol 18, No 4, 1978 pp 602-607

[Article by I. D. Lozovatskiy, Institute of Oceanology, "Short-Period Variability of Temperature Field in Coastal Zone of Sea"]

[Abstract] The author analyzes the results of measurements of the vertical structure of the temperature field in the coastal zone of the Baltic Sea. It was found that in the upper homogeneous layer of the sea the observed change in temperature can be described within the framework of the semi-empirical equation of turbulent heat conductivity, without advective terms being taken into account. For the value of the coefficient of horizontal turbulent exchange and rate of dissipation of turbulent energy the estimates obtained were $3.2 \cdot 10^3$ $cm^2 \cdot sec^{-1}$ and $3.7 \cdot 10^{-3}$ $cm^2 \cdot sec^{-3}$ respectively. The variability of the temperature field in the thermocline has the nature of the passage of singular fronts, behind which there is an increase in the intensity of temperature fluctuations.
[22]

HORIZONTAL GRADIENTS OF SURFACE TEMPERATURE IN NORTH ATLANTIC

Moscow OKEANOLOGIYA in Russian Vol 18, No 4, 1978 pp 614-618

[Article by E. I. Karabasheva and V. D. Pozdynin, Institute of Oceanology, "Statistical Characteristics of Horizontal Surface Temperature Gradients in the North Atlantic and Norwegian Seas"]

[Abstract] This paper deals with the statistics of horizontal gradients of surface temperature which were determined from the temperature differences at distances of about 0.1-2 km. The initial data were collected on the 15th voyage of the scientific research ship "Akademik Kurchatov" (June-September 1973). The measurements were made for the purpose of studying the structure of the field of surface temperature in zones of contact between water masses with different temperature characteristics (the vessel repeatedly intersected the boundaries of the Gulf Stream, Labrador and East Greenland Currents,

as well as the Irminger Current. An exponential distribution was used for describing the empirical distributions of these gradients. In certain cases use was made of a special form of a hyperexponential distribution with two terms. Estimates of the parameters of the distributions and the statistical characteristics of the gradients are given.
[22]

STATIONARY MOTION OF STRATIFIED FLUID OVER UNEVEN BOTTOM

Moscow OKEANOLOGIYA in Russian Vol 18, No 4, 1978 pp 581-586

[Article by V. F. Kozlov and M. A. Sokolovskiy, Far Eastern State University and Pacific Ocean Oceanological Institute, "Stationary Motion of a Stratified Fluid Over an Uneven Bottom (Geostrophic Approximation on the β-Plane)"]

[Abstract] In a geostrophic approximation on the β-plane the authors have formulated the problem of the motion of a zonal stably stratified flow of fluid over an isolated disturbance of bottom topography. A solution is obtained in the form of a series in powers of the logarithm of local depth. It is shown that in the case of a linear stratification over an obstacle a three-dimensional cyclonic (anticyclonic) eddy is formed whose intensity attenuates (strengthens) with depth for an easterly (westerly) oncoming flow with a constant depth.
[22]

MAGNETIC SURVEY IN OCEAN IN RELATION TO GEOMAGNETIC NAVIGATION

Moscow OKEANOLOGIYA in Russian Vol 18, No 4, 1978 pp 754-755

[Article by A. A. Shreyder, Institute of Oceanology, "Component Magnetic Survey in the Ocean in Relation to Problems of Geomagnetic Navigation"]

[Abstract] During 1975-1976, on the 58th voyage of the "Vityaz'" scientific research vessel in the Indian Ocean, a component magnetic survey was made along the vessel's route along profiles with a total length of 9,000 miles. The investigations were made using a KM-3 component magnetometer in combination with a "Meridian" specialized computer. In the course of the work the T, Z, H and I values were measured or computed. On the basis of this work it was possible to carry out practical testing of a geomagnetic method for ascertaining a ship's position. When using preobserved fields as a standard for chart comparison the error in coordinates was close to ±6 miles, whereas when relativity fields are used the error is not greater than ±20 miles. It is concluded that the most effective method for the purposes of routine determination of coordinates is the use of theoretically computed geomagnetic fields.
[22]

STRUCTURE AND KINEMATICS OF FIELD OF SYNOPTIC EDDIES

Moscow OKEANOLOGIYA in Russian Vol 18, No 4, 1978 pp 593-601

[Article by L. M. Fomin and A. D. Yampol'skiy, Institute of Oceanology, "Structure and Kinematics of Field of Synoptic Eddies in the Open Ocean According to Data from the Poligon-70 Experiment"]

[Abstract] On the basis of measurements in an experimental hydrophysical polygon in the Atlantic Ocean (1970) the authors have evaluated the parameters of four progressive plane waves making up synoptic disturbances of current velocity at the 300-m horizon. The synoptic ocean eddies observed in the experiment are represented in the form of the sum of two fields of eddies with a dense packing of the eddy formations. The latter in turn are approximated by a system of plane waves with lengths of several hundred kilometers and with periods of about three months and a year. The synthesized charts of streamlines of currents on a synaptic scale demonstrate the complex structure of the field of eddies in the region of the experimental polygon and its change with time.
[22]

SECONDARY ENRICHMENT OF RIFT ZONE HYPERBASITES BY URANIUM

Moscow OKEANOLOGIYA in Russian Vol 18, No 4 pp 654-659

[Article by A. S. Zhitkov, S. S. Yakovleva and A. Ya. Krylov, Pacific Ocean Oceanological Institute, "Possible Causes of Secondary Enrichment of Hyperbasites in the Rift Zones of the Mid-Ocean Ridges with Uranium"]

[Abstract] The article gives the results of investigation of the content of uranium and potassium in the basic and ultrabasic rocks in the mid-oceanic ridges of the Indian and Atlantic Oceans. With respect to genesis, it is possible to define three processes leading to an increase in the uranium content in hyperbasites. The first is a hydrothermal modification, the second is an interaction between the matter in rocks and sea water, the third is the sorption of uranium by iron and manganese hydroxides filling the cracks and voids in rocks. The sources of the uranium are hydrothermal solutions and sea water. The deposition of iron and manganese hydroxides with high uranium concentrations on the surface of rock fragments and in fissures is also possibly associated with underwater volcanism. The primary content of uranium and potassium in ocean peridotites is low ($n \cdot 10^{-9}$ g/g). On this basis it is postulated that the peridotites constitute a residue after basalts are melted out from pyrolite.
[22]

FORMULA FOR ESTIMATING LIGHT ATTENUATION BY OBSERVING SUBMERGED WHITE DISK

Moscow OKEANOLOGIYA in Russian Vol 18, No 4, 1978 pp 750-753

[Article by V. I. Man'kovskiy, Marine Hydrophysical Institute, "Empirical Formula for Estimating Index of Light Attenuation in Sea Water from Depth of Visibility of White Disk"]

[Abstract] The depth of visibility of a white disk z_w is a subjective hydrooptical characteristic but it can be used in a quantitative evaluation of the the index of attenuation of radiation by sea water ϵ. The standard formula developed for this purpose in the Soviet Union was based on studies in internal seas. A study has now been made to ascertain its applicability for the ocean and for depths of 60 m, rather than 30 m. Studies were made in different types of sea and ocean waters. Observations were made both in sunny weather and in the presence of different cloud situations. The waves at sea did not exceed class 3. The observer was 6 m above sea level. The attenuation index was determined in the blue-green spectral region λ = 505 nm. Processing of the collected data (111 points) indicated presence of a high degree of correlation between the depth of disk visibility and the mean value of the attenuation index to a depth of 62 m. A new equation was derived for such work at sea. There is a good agreement between the old and new formulas.
[22]

NONLINEAR WAVE DISTURBANCES IN MAIN OCEANIC THERMOCLINE

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 241, No 6, 1978 pp 1436-1439

[Article by P. S. Lineykin, USSR Hydrometeorological Scientific Research Center, "Nonlinear Wave Disturbances in the Main Oceanic Thermocline"]

[Abstract] In an earlier study by the author (IZV. AN SSSR, FIZ. ATM. I OKEANA, Vol 10, No 4, 1974) he presented a theoretical description of large-scale wave disturbances in current velocity and density of sea water caused by the seasonal variation of wind and heat flows at the surface of a baroclinic ocean. With special assumptions concerning the boundary conditions on the eastern shore, the amplitude of the wave components of velocity is comparable to the mean velocity at a given point. As a result, the large-scale horizontal circulation within the limits of the thermocline and below it to all intents and purposes breaks down into several cells with a closed circulation system extending from the northeast to the southwest and moving to the west-northwest during the course of the year. In a later study a nonlinearity effect which was not earlier taken into account was defined and analyzed. This effect involves the formation of fronts between the circulation cells, or to be more precise, zones of marked changes in geostrophic velocities and horizontal density gradients. The existence of such

discontinuities follows from the properties of solution of a differential equation which the surface density field must satisfy when there is a special form of the potential function of the system of equations for the hydrodynamics of a baroclinic ocean. A peculiarity of such a potential function is that it decreases exponentially with depth. The boundary conditions do not play a decisive role in the forming of fronts. In this new paper, essentially a continuation of the author's previous work, it is shown that such an effect of formation of frontal zones can be observed for any self-similar potential function. In addition, it is shown that it is possible to estimate the influence of ocean depth on the wave length of the disturbance and the velocity of its propagation.
[580]

LAYER OF MINIMUM CONDUCTIVITY IN WORLD OCEAN

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 242, No 2, 1978 pp 434-437

[Article by D. M. Filippov and S. A. Oleynikov, All-Union Scientific Research Institute of Marine Fishing and Oceanography and All-Union Scientific Research Institute of Hydrometeorological Information-World Data Center, "The Layer of Minimum Conductivity Values in the World Ocean"]

[Abstract] Using data from hydrological stations occupied in the world ocean by Soviet and foreign researchers during the period 1920-1970, the authors for each station ascertained the conductivity of sea water at standard horizons. Then, using 5° squares as a unit area, statistical processing was carried out for all stations falling in the grid square for half-years (warm and cold) and for the year. The analysis revealed that the conductivity of sea water has a number of peculiarities. These include the presence of a deep water layer with minimum conductivity values. Figures 1, 2 and 3 in the text show: conductivity in situ at surface, depth of core of water layer with minimum conductivity, conductivity in core of layer with minimum values. The depth of this layer minimum in the North Pacific is 1,500-2,500 m and this decreases regularly from 2,500 m at the equator to 1,500-1,600 m at a latitude of 60°N. In the latitude zone of the Pacific from 0 to 25-30°N the relief of this surface is even; there the water layer with minimum conductivity values lies at an average depth of 2,500 m. In the northern part of the Pacific Ocean conductivity decreases with an increase in latitude from $31.5 \cdot 10^{-3}$ $(ohm \cdot cm)^{-1}$ to the east of the Kurile Islands. In the upper layer of the ocean (above the deep layer of water with minimum conductivity values) the value of the D parameter increases with a decrease in depth, but the nature of this increase is quite complex. In the middle and high latitudes in individual seasons in the upper layer of the ocean there can be local layers with reduced conductivity values.
[35]

MARINE SUBMICRON AEROSOLS ANALYZED

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 242, No 4, 1978 pp 800-803

[Article by Yu. V. Zhulanov, B. F. Sadovskiy, O. N. Nikitin and Academician I. V. Petryanov, Scientific Research Physicochemical Institute, "Investigation of Marine Submicron Aerosols"]

[Abstract] Measurements of the concentrations and particle-size distributions of marine aerosols were made around-the-clock for a period of three months in the Mediterranean Sea and in different regions of the Atlantic, including in the course of July at point "C" of the WMO. The results of different measurements of the particle-size distribution in the Mediterranean and Atlantic in the region of the Strait of Gibraltar in the presence of westerly winds and also in the region of Cape Verde are analyzed. The distributions of aerosols in these regions are identical except for a more clearly expressed distribution maximum in the Atlantic, which is approximated by a Junge distribution with $\beta = 3.3\text{-}3.7$ with a maximum in the region of particle sizes 0.20-0.25 μm in diameter. The highest concentrations in the presence of an intensifying wind (up to 15 m/sec) and increasing humidity (up to 85%) were obtained in the Gibraltar region. Comparison of these results with the data obtained in the Cape Verde Islands region shows that the concentration of aerosols in the Mediterranean Sea is several times greater than in regions remote from the continent and is caused, evidently, by its influence. It was found that the distributions obtained under conditions of generation of marine particles exhibit a maximum in the range of particle sizes 0.10-0.15 μm, indicating the generation of salt particles of these sizes. The distributions obtained in air masses carrying old modified aerosols exhibit a shifting of the maximum into the range of sizes 0.20-0.25 μm.
[36]

USE OF NONLINEAR SPECTRAL TRANSFORMS IN SUPPRESSING MULTIPLE WAVES

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA, GEOLOGIYA in Russian No 4, 1978 pp 36-45

[Article by A. V. Kalinin, Department of Seismometry and Geoacoustics, Moscow State University, "Use of Nonlinear Spectral Transforms for Suppressing Multiple Waves Associated with the Water-Air Discontinuity"]

[Abstract] A specific characteristic of continuous seismic profiling at sea by the vertical ray method is that the most intense wave interference is formed with the participation of the water-air discontinuity. The elimination of wave interference of this type involves reverse filtering of the registered oscillations, as proposed by G. Kunetz (GEOPHYS., Vol 33, No 3, 1968). But two very important questions remain open: what should be

the frequency band in which it is necessary to carry out reverse filtering? What will be the effectiveness of such an operation for the case of spherical waves, that is, for a real case? In this paper the author examines a new approach to the problem of suppressing wave interference making it possible not only to answer these questions, but also to evaluate the limits of applicability of the operation of suppressing these waves in the case of nonhorizontal reflecting discontinuities. The proposed method makes it possible to eliminate all the waves forming with participation of the water-air discontinuity. The method does not require a preliminary knowledge of the coefficient of reflection from the bottom, which considerably broadens its possibilities. It gives a higher effect of suppression of multiple waves the lesser the velocity differentiation of the medium. However, in comparison with the Backus method, the proposed method is disadvantageous in that its application requires reliable information on the spectrum of excited oscillations with respect to both form and intensity.
[581]

III. TERRESTRIAL GEOPHYSICS

Abstracts of Scientific Articles

REVIEW OF INERTIAL GEODETIC SYSTEMS

Moscow GEODEZIYA I KARTOGRAFIYA in Russian No 8, 1978 pp 24-26

[Article by G. V. Cheremisenov, "Inertial Geodetic Systems"]

[Abstract] Inertial geodetic systems are new and extremely promising measurement instruments which make it possible to measure, autonomously and regardless of weather conditions or time of day, the three coordinates, acceleration of gravity and plumb-line deflection at points on the earth's surface. The extent of the measured line can be several tens of kilometers and the duration of continuous instrument work is several hours. The article uses the American "Litton" platform inertial geodetic system as an example of such a system. Inertial geodetic systems can be used extensively in creating a geodetic base for a topographic survey of the land and in a gravimetric survey of the shelf and ocean. In addition to an increase in work productivity one can expect a substantial increase in the accuracy of a gravimetric survey. In an aerial survey inertial geodetic systems can be employed for determining the coordinates of the aircraft. It is promising to employ these systems for a survey of the shelf from underwater vehicles. On their basis it is possible to create autonomous and completely automatic apparatus for a topographic and gravimetric survey of the bottom in accordance with a definite program. It is desirable that inertial geodetic systems be employed in combination with satellite geodetic systems. [3]

INVESTIGATION OF MSD-1M PULSED-LIGHT RANGEFINDERS

Moscow GEODEZIYA I KARTOGRAFIYA in Russian No 8, 1978 pp 29-32

[Article by V. V. Kislukhin and V. A. Shashkov, "Investigation of the MSD-1M Pulsed-Light Rangefinder"]

[Abstract] In investigations of the MSD-1M pulsed-light rangefinder at the Leningrad Institute of Railroad Transportation Engineers the emphasis was on a determination of cyclic errors, the constant correction, perfecting

of the measurement method and evaluation of the accuracy of these results. Investigation of cyclic errors, determining primarily the accuracy of a phase-type pulsed-light rangefinder, was carried out on short bases (from 3 to 5 m) in February and August 1976. The constant corrections were +0.644 and +0.650 m respectively and their mean square errors, determined from 11 and 14 measurements, were ±0.4 and 0.5 mm. The base used was the VNIMI laboratory comparator. The phase cycle of the MSD-1M is 1 m. During the investigations the reflector was moved each 10 cm within the limits of the phase cycle. The lines were measured in one set at three fixed frequencies. Each set included two readings corresponding to phase angles differing by 180°. There was found to be a stable correlation dependence between line length and the MSD-1M constant correction. It is important to take meteorological conditions into account. An error in determining temperature and pressure of 2° and 5 mm Hg distorts a distance of 500 m by 1 mm. When carrying out precise measurements it is necessary to make sure that there are no great temperature variations along the entire line. Measurements of temperature at the sites of rangefinder and reflector setup during line measurement indicate that the temperature difference can attain 6° at a distance of 100 m. Temperature measurements must therefore be made at the rangefinder, reflector and midway between.
[3]

"DAM" EARTHQUAKES IN NEIGHBORHOOD OF RESERVOIR

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 240, No 2, 1978 pp 302-305

[Article by Sh. G. Idarmachev and O. M. Barsukov, Geology Institute of the Dagestan Affiliate USSR Academy of Sciences, "'Dam' Earthquakes and Variation of Resistivity of the Rock Mass in the Neighborhood of the Chirkeyskoye Reservoir"]

[Abstract] In the seismically active region of Dagestan work is proceeding on construction of the Sulakskiy cascade of hydroelectric power stations. For this reason the prediction of strong earthquakes near these structures is of great importance. A year before onset of filling of the Chirkeyskoye Reservoir a network of polygonal seismic stations was set up for monitoring seismicity in the region. A figure in the text is a histogram of the number of weak tremors before and after filling the reservoir. Data are presented indicating an increase in seismicity since the filling of the reservoir. The geological-geophysical conditions in the reservoir region favor investigations of the mechanism of preparation of a "dam" earthquake. Included are data obtained from statistical observations of temporal changes in apparent resistivity in the reservoir neighborhood. It was noted that observed changes in apparent resistivity are related to the process of preparation of earthquakes. The period of intensive change in apparent resistivity before earthquakes is 20-30 days (whereas for the Garm and San Andreas

regions it was from 2 to 2.5 months). The amplitude of the decrease in apparent resistivity of 40% in the Chirkeyskoye Reservoir region exceeds the corresponding values registered in the Garm and San Andreas regions (18 and 24%). The various collected data make it possible to postulate that the reservoir exerts an influence on the normal process of preparation of an earthquake which can occur close to a reservoir.
[13]

GLOBAL PATTERN OF INSTANTANEOUS KINEMATICS OF LITHOSPHERIC PLATES

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA, GEOLOGIYA in Russian No 4, 1978 pp 20-35

[Article by Yu. I. Galushkin and S. A. Ushakov, Geophysics Department, Moscow State University, "Global Pattern of Instantaneous Kinematics of Lithospheric Plates"]

[Abstract] Within the limits of a global model of motion of lithospheric plates the authors have computed the positions of the poles of relative rotation of the plates and the angular velocities of rotation, taking into account additional new data concerning movement at the boundaries of the plates. It was possible to determine more precisely the positions of the poles of relative rotation of these plates: Africa-Antarctica, South America-North America, Eurasia-Africa. The global model also includes the Caribbean and Philippine plates and the corresponding poles of rotation were computed. A further refinement of the parameters of relative movements of the plates will affect primarily the small plates entering into the make-up of the planetary zones of compression of the lithosphere. It was possible to compute the ellipses of the 95% confidence coefficient for the position of the poles of rotation of the plates in the coordinate system of the "hot spots" and the corresponding parameters of rotation of a series of plates were refined. These findings are graphically illustrated in three full-page maps.
[581]

TERRESTRIAL TECTONICS IN LIGHT OF COMPARATIVE PLANETOLOGY

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 241, No 4, 1978 pp 903-905

[Article by Corresponding Member USSR Academy of Sciences Yu. M. Pushcharovskiy, Geological Institute USSR Academy of Sciences, "Problems in Tectonics in Light of Comparative Planetology"]

[Abstract] Recently, as a result of investigation of planets of the earth group, a clearly expressed structural asymmetry has been established on Mars and is detected on Mercury. The Martian asymmetry is expressed in a

concentration of maria in its northern hemisphere. This is a common feature of both planets. Together with the earth, these planets and the moon are in different stages of tectonic development. In comparison with the earth, the development of the moon and Mercury corresponds to the earth's earliest stages. With respect to Mars, its development has possibly reached the stage of the formation of sectors of the "granite" layer. Therefore, asymmetry in structure is a property which is very stable with time. Accordingly, the conclusion that there was a primary inhomogeneity of the corresponding planets and the moon is quite sound. Since the motion of the continental blocks occurs in one-half of the earth and does not affect the second, the conclusion is inevitable that there is a barrier to this movement and this barrier is the crust and mantle of the Pacific Ocean. It is natural to expect complex geodynamic processes along the periphery of the Pacific Ocean and these are observed. With respect to Venus, new data suggest a great similarity in structure and development between the earth and Venus. It is probable that on Venus there are both basalts and granitoids, that is, that there is a differentiation of the deep layers of the planet. Radar studies of Venus have revealed the presence of volcanoes, enormous circular (probably lava) fields and major grabenlike tectonic forms. The tectonic asymmetry of this planet therefore should be similar to the structure of planets of the earth group.
[12]

BOTTOM RELIEF OF EURASIAN ARCTIC BASIN

Leningrad VESTNIK LENINGRADSKOGO UNIVERSITETA. GEOLOGIYA, GEOGRAFIYA in Russian No 12, Vyp 2, 1978 pp 94-102

[Article by A. F. Grachev and G. D. Naryskin, Leningrad State University, "Principal Characteristics of Bottom Relief of the Eurasian Basin of the Arctic Ocean"]

[Abstract] On the basis of new data collected during recent years in a complex geophysical study of relief and direct bottom measurements, the authors give a brief description of the principal elements of bottom morphology of the oceanic part of the Eurasian basin, devoting particular attention to the conspicuous rise between the Amundsen and Nansen basins. This rise has the distinctive features of a mid-oceanic ridge, as is supported by the graphic materials (lateral and longitudinal profiles) accompanying the text. The article gives a description of the three most important relief elements in the region: continental margin, abyssal plains and mid-oceanic ridge (the relief of shelf areas is not included). A table of morphometric characteristics of the continental slope is included. There is a map of the principal geomorphological provinces of the Eurasian basin. The bottom morphology, examined in its totality, shows that while having geomorphological criteria typical for other oceanic depressions, the Eurasian basin also has a clearly expressed individuality of relief which is attributable to the youth of the entire basin.
[21]

STRUCTURE AND DEFORMATION OF AREA OF GAZLIY EARTHQUAKE AREA BASEMENT

Moscow IZVESTIYA AKADEMII NAUK SSSR, SERIYA GEOLOGICHESKAYA in Russian
No 9, 1978 pp 110-118

[Article by N. V. Lukina, Geological Institute USSR Academy of Sciences, "Structure and Deformations of Basement Surface in Region of the Gazliy Earthquakes"]

[Abstract] The Pre-Mesozoic basement of the Kyzylkum and the region of Gazliy earthquakes is broken by a dense network of tectonic dislocations: west-northwesterly, latitudinal, submeridional, northeasterly, northwesterly and east-northeasterly, differently oriented in its different structural stages. During the period of Mesozoic and Neogene-Quaternary tectonic movements in each of the mentioned directions found reflections in deformations of its surface. In particular, in the epicentral zone of Gazliy earthquakes there was particularly clear manifestations of sublatitudinal and northwesterly, and also northeasterly and submeridional deformations. These deformations determined the orientation of the fissures forming after seismic tremors.
[33]

NUMERICAL INVESTIGATION OF CYLINDRICAL SHOT

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 241, No 6, 1978 pp 1311-1314

[Article by P. F. Korotkov and B. M. Prosvirnina, Institute of Physics of the Earth, "Numerical Investigation of a Cylindrical Shot in an Elastico-Plastic Medium"]

[Abstract] A cylindrical shot is more complex for theoretical investigations than a spherical shot. Whereas the expansion of a spherical cavity is described by finite formulas, for solution of this same problem in the case of a circular cylinder it is necessary to make numerical computations. The authors have made a study of a shot with cylindrical symmetry. In the cavity a high pressure is stipulated which decreases with expansion in accordance with the adiabatic law. A nonstationary elastico-plastic movement of the medium with great deformations is described by a system of differential equations in partial derivatives consisting of the laws of conversation of momentum, mass and energy and also the differential relationships between stresses and strains. The article gives computations for different values of the yield stress for the medium and the initial pressure in the cavity. A thorough analysis is made of the mechanisms involved in the process. It is shown that in general the picture of development of cylindrical and spherical shots is similar.
[580]

DETERMINATION OF MECHANICAL QUALITY OF EARTH'S MANTLE

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ZEMLI in Russian No 9, 1978 pp 55-73

[Article by V. M. Dorofeyev and V. N. Zharkov, Institute of Physics of the Earth, "Determining the Mechanical Quality of the Earth's Mantle"]

[Abstract] The article briefly sets forth the history of study of the distribution of the dissipative factor Q_μ in the deep layers of the earth on the basis of data on characteristic oscillations of the earth. The paper systematizes and investigates the internal matching of experimental data on attenuation of these characteristic oscillations of the earth. For this purpose the authors have introduced the concept of a self-consistent band of experimental data. Data are given on a study of the dissipative properties of the earth's deep layers, taking into account the band of experimental data on the characteristic oscillations and surface waves. The problem is solved in the formulation of the inverse problem in geophysics using the linear programming method. It was possible to determine the band of admissible Q_μ values for a seven-layer model of the crust and mantle and a new working model is proposed for the distribution of Q_μ, whose distinguishing characteristic is zones of low Q_μ at the top and bottom of the mantle. [34]

STUDY OF SITES OF OCCURRENCE OF VERY STRONG PACIFIC OCEAN EARTHQUAKES

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ZEMLI in Russian No 9, 1978 pp 31-42

[Article by A. D. Gvishiani, A. V. Zelevinskiy, V. I. Keylis-Borok and V. G. Kosobokov, Institute of Physics of the Earth, "Investigation of the Sites of Occurrence of Very Strong Earthquakes in the Pacific Ocean Zone Using Recognition Algorithms"]

[Abstract] Image recognition methods were employed in an investigation of the general criteria for those sectors of the Pacific Ocean seismic zone where very strong earthquakes occur (with a magnitude $M \geqslant 8.2$). The authors have defined such sectors, including those where extremely strong earthquakes for the time being are unknown. The reliability of the results is confirmed by control experiments, the most important of which is the following: the criteria found using data only on the eastern part of the zone make it possible to recognize in the remaining part the overwhelming majority of the places where there are epicenters of very strong earthquakes. The investigation for the most part was carried out using the "Kora-3" algorithm. Figure 1 in the text is a full-page map of epicenters in the Pacific Ocean seismic zone. Figure 2 is a full-page map showing the results of recognition using the "Kora-3" algorithm. Figure 3 is a corresponding

map compiled using simple criteria. The study can be useful in investigating the following problems: plotting the global system of faults; predicting the time of earthquakes; evaluation of seismic risk.
[34]

REVIEW OF THE STUDY OF EARTH TIDES

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ZEMLI in Russian No 9, 1978 pp 43-54

[Article by N. N. Pariyskiy, Institute of Physics of the Earth, "Study of Earth Tides"]

[Abstract] This article is a brief review [47 sources are cited] of theoretical and experimental studies carried out at the Institute of Physics of the Earth in the area of study of earth tides and gives a summary of all the observations in the USSR on tidal changes of gravity (12 stations, 16,000 instrument-days of observations). The mean value δ = 1,160±0.002. The regional difference between the European and Asiatic stations is $\Delta\delta$ = +0.0208±0.0042. Resonance with a diurnal nutation is observed $\delta(O_1) - \delta(K_1)$ = 0.0227±0.0011. The mean phase lag in gravity changes is $\Delta\varphi(M_2, S_2)$ = -0°.15±0°.09; $\Delta\varphi(O_1, K_1)$ = -0°.08±0°.07. A full-page map in the text shows the distribution of stations for the observation of tidal changes of gravity and tilts in the territory of the USSR.
[34]

STRUCTURE OF CORE-MANTLE TRANSITION ZONE

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 240, No 4, 1978 pp 813-816

[Article by V. P. Myasnikov and V. D. Savushkin, Moscow State University, "Structure of the Core-Mantle Transition Zone in a Hydrodynamic Model of the Earth's Evolution"]

[Abstract] An analysis of the equations for evolution of the earth derived earlier by the authors (DAN, Vol 238, No 5, 1978) leads to the necessity for a study of the processes transpiring in the transition zone between the core and mantle. This transition zone can be characterized by a great concentration gradient and can be investigated by the method described by the author in DAN, Vol 29, No 5, 1978. An additional problem arising in this case involves the need for a definite detailed breakdown of the thermodynamic conditions marking the position of the transition layer in the depths of the planet. Here the authors examine a very simple possible model of a transition zone on the assumption that in this zone the temperature of melting of mantle matter is attained and with passage through which there

is a marked change in the viscosity and sedimentation coefficients. The stipulation of temperature T_0 in the transition zone, the mean pressure continuity condition, diffusion flux and integral conditions for the conservation of the earth's total mass and the mass of the heavy component make it possible to close the problem of determining the mean geophysical fields p, T, c, φ , ρ and to find the size of the core. Since the radial velocities in the transition zone are equal to zero and the derivative is non-zero and continuous, in the mantle and core near the transition zone there can be movements of only two types. The first type is represented by two counter currents moving from the core and mantle to the discontinuity, whereas the second is described by two flows carrying matter from the transition zone to the core and mantle. In one region, where there is an outflow of matter from the boundary, there is a smooth profile of concentrations. Regions of this type give rise to nonuniformities in the concentration field in the core and mantle.
[14]

MODEL OF A PETROLEUM AND GAS DEPOSIT

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 242, No 2, 1978 pp 398-401

[Article by Corresponding Member USSR Academy of Sciences V. V. Fedynskiy, K. B. Ashirov and S. S. Azarov, Moscow State University, Kuybyshev Polytechnic Institute, and All-Union Scientific Research Institute of Geophysical Prospecting Methods, "Model of a Petroleum and Gas Deposit as an Object for Direct Geophysical Search"]

[Abstract] A study was made of one of the possible geophysical models of a deposit of hydrocarbons on the basis of geological information accumulated in a study of commercial petroleum and gas deposits. The currently used schematic representations of models of a deposit of hydrocarbons are correct but are not always adequate for an interpretation of the actual geophysical material. The model is complicated by the influence of the paragenetic factors accompanying the formation of a hydrocarbon deposit. An example of such a complication is the presence in a number of petroleum and gas deposits of a zone of secondary mineral formation sealing the bottom of the deposit. The sealing layer genetically associated with the deposit, such as encountered in the petroleum deposits along the Volga near Kuybyshev, constitutes an excess mass whose gravitational influence can considerably exceed the influence of the deposit itself. In such a situation the positive gravitational effect of the sealing layer can serve as an indirect exploration criterion for the presence of a petroleum or gas deposit. The presence of this layer can exert a substantial influence on the observed geophysical parameters, in particular, changing the expected sign of the local gravitational anomalies from negative to positive.
[35]

INVERSION OF REFRACTED WAVE TRAVEL-TIME CURVE

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 241, No 4, 1978 pp 793-796

[Article by V. S. Geyko, Geophysical Institute, Ukrainian Academy of Sciences, "Inversion of Refracted Wave Travel-Time Curve"]

[Abstract] The ambiguity in determining the dependence of the velocity of a seismic wave on depth from the travel-time curve of a refracted wave has been studied in detail in earlier studies. In this new study it is shown that with some additional assumption concerning the properties of the depth-velocity function, sufficiently general from the physical point of view, this nonuniqueness is considerably reduced: using the travel-time curve there is an unambiguous determination of velocity outside the waveguide and the precise upper and lower velocity boundaries in each waveguide. For finding the dependence of velocity on depth the author has derived formulas for inversion of the generalized seismic travel-time curve (travel-time curve of the refracted or reflected wave).
[12]

REVIEW OF PROBLEMS INVOLVED IN PREDICTING EARTHQUAKES

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ZEMLI in Russian No 9, 1978 pp 13-30

[Article by M. A. Sadovskiy and I. L. Nersesov, Institute of Physics of the Earth, "Problems in Earthquake Prediction"]

[Abstract] A decrease in losses inflicted by an earthquake is ensured by seismic regionalization, detailed seismic regionalization, prediction of the site, time and intensity of earthquakes. All these directions in research are based on a combining of geological, seismological, geodetic and geophysical methods. In the example of studies in the Garm polygon the authors demonstrate the nature of the change of individual geophysical parameters and the combination of these parameters prior to the earthquakes of 1976 and 1977. Table 1 is a general summarization of prediction research for reducing the aftereffects of earthquakes; Table 2 lists the measures to be taken in relation to earthquake prediction. Figure 1 is a block diagram of prediction observations. Fig. 2 shows the nature of prediction signals as a function of time and other parameters and the dependence of the extent of the focus, extent of the area of preparation of an earthquake and the observation time of precursors on earthquake magnitude. Fig. 3 shows the layout of the Garm prognostic polygon. Fig. 4 shows changes in the focal mechanism with time. Fig. 5 shows vertical movements of geodetic benchmarks in relation to seismic activity. Fig. 6 shows deformation and tiltmeter data. Fig. 7 shows magnetic anomalies. Fig. 8 illustrates observations with a magnetohydrodynamic generator and changes in resistivity. Fig. 9 shows examples of records

of the electric current in the atmosphere before an earthquake. Fig. 10 shows changes in the seismic regime in the Garm region. All the experimental observations carried out in the Garm polygon during 1976 and 1977 show that routine prediction of the intensity and time of an earthquake is entirely possible.
[34]

LIMITS OF COMPUTATION REGION IN SOLVING PROBLEMS IN GEOTHERMY

Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY, GEOLOGIYA I RAZVEDKA in Russian No 7, 1978 pp 111-117

[Article by M. L. Bakhmutskiy, O. B. Novik and M. N. Smirnova, Moscow Geological Prospecting Institute, "Selection of Limits of Computation Region in Solving Direct Problems in Exploratory Geothermy"]

[Abstract] By solving the problem formulated in this paper, it is possible to obtain graphs of the dependence of the heat flow component normal to the surface characteristic for different two-dimensional structures on the coordinate y across the strike. This makes it possible to check different hypotheses concerning the configuration, extent, and distribution and thereby facilitates the problem of interpreting data from geophysical observations. In this paper it is shown that with a definite accuracy in measuring temperature and heat flow and solving the formulated boundary problem it is possible to obtain an evaluation of the resolution of the geothermal method relative to these factors. Selecting as the inhomogeneity an appropriate doubly or multiply bound region, it is also possible to evaluate the influence of alluvium, stratification (with horizontal and sloping strata) on the form of profile of the anomalous heat flow of the geothermal field diffracted on inhomogeneities in a medium with the mentioned peculiarities. The method described in this paper makes it possible to clarify, for inhomogeneities with stipulated geometric characteristics and contrast, the problem of the possibility of detecting these inhomogeneities with different responses of the measuring instruments.
[576]

DETERMINING GEOID UNDULATIONS FROM SEISMIC AND GRAVITY DATA

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 241, No 4, 1978 pp 789-792

[Article by L. P. Vinnik, A. A. Lukk, M. Mirzokurbonov, Yu. A. Tarakanov and T. N. Cherevko, Institute of Physics of the Earth, "Sources of Major Undulations of Geoid According to Seismic and Gravitational Data"]

[Abstract] The nature of major geopotential anomalies is one of the difficult problems in terrestrial physics. Here the authors have used a new technique for solving the inverse problem for the gravity field with new seismic data

obtained using large seismic groups. The most complete analysis was made for the Indian anomaly, the largest on the earth. Specifically, observational data are used for profile A, which passes near the center of the Indian anomaly. The data cited in the paper indicate that a high-velocity block in the lower mantle extends to the west of the center of the gravitational anomaly for a distance of 1,000-1,500 km. The Indian anomaly corresponds to a perturbed mass which exceeds by a factor of three the mass obtained directly from an analysis of the gravitational field. The article examines the question of whether the Indian anomaly is a special phenomenon or whether essentially similar models are suitable for explaining other major anomalies. Analysis of the example suggests that in an earth in isostatic equilibrium the anomalous mass situated at some depth must be compensated by a mass of the opposite sign, situated at a different depth in this same rock column. Anomalous masses of the opposite sign, situated in regions of major anomalies of the geoid, compensate one another only partially, which causes the gravity anomalies observed at the surface. It can be concluded that the upper mantle and upper part of the transition zone (400-650 km) virtually do not participate in the formation of these anomalies. It can be postulated that the reason for the observed distribution of anomalous masses is a greater viscosity of the bottom of the transition zone and the lower mantle, with which the once-impaired equilibrium persists over a long period of time.
[12]

NEW RESISTIVITY METER WITH TOROIDAL SENSORS

Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY, GEOLOGIYA I RAZVEDKA in Russian No 7, 1978 pp 98-104

[Article by I. A. Marayev, V. N. Orlov, M. I. Plyusnin, L. D. Ovchininskaya, Yu. V. Byalyy and V. P. Doshchechkin, Moscow Geological Prospecting Institute, "Method for Designing an Induction-Type Resistivity Meter with Toroidal Sensors"]

[Abstract] Since 1972 specialists at the Moscow Geological Prospecting Institute have been developing an induction-type resistivity meter with toroidal sensors. This article describes a method for designing an induction-type resistivity meter which makes it possible to carry out the selection of its parameters, taking into account the conditions for instrument operation in boreholes. In the theoretical part of the study the authors examine the field of a toroid, a closed circular solenoid through whose winding flows an alternating current I which varies in conformity to the law $\exp(i\omega t)$. The magnetic field of the toroid is concentrated within. In accordance with the second Maxwell equation the change in the magnetic flux Φ within the toroid leads to the appearance of a variable electric field, whose closed lines of force surround the toroid. The eddy electric field in the conducting medium causes the appearance of an induced current with a value closely related to the specific conductivity of the medium. In the developed

model the principal parameters of the sensor are: frequency f = 150 KHz, number of turns n = 37, current intensity I = 0.5 A. The toroids are wound on magnetic leads of Alsifer. The outer diameter of the toroidal sensor is 0.045 m, the diameter of the opening is 0.014 m. The range in measuring resistivity is from 0.15 to 10 ohm•m. In addition to the sensor, the induction-type resistivity meter includes an electronics unit, consisting of a generator, amplifier, rectifier and stabilizer for the amplifier power voltage.
[576]

FANLIKE SPREADING OF CRUST AND NATURE OF BENIOFF ZONES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 240, No 4, 1978 pp 922-925

[Article by Ye. S. Shtengelov, Odessa State University, "Fanlike Modern Spreading of the Earth's Crust and the Nature of Benioff Zones"]

[Abstract] The author's investigations since 1973 have shown that the earth's crust of the continents is in a state of spreading. It is expressed in numerous linear zones of reduced rock density with blocks of residual horizontal compression between them. This geodynamic zonality is observed everywhere, including ancient platforms, but it is most clearly expressed within the limits of young folded mountain structures and near them. In each region there are zones of spreading subparallel to the contours of nearby folded mountain structures and subperpendicular to them. The worsening of the strength properties of rocks in the spreading zones is the reason why many of them are expressed geomorphologically (river valleys, lakes, canyons, etc.). One of the most remarkable peculiarities of the arrangement of zones of modern spreading of the continental crust is its fanlike appearance. This is graphically manifested, for example, in the Crimea. The outer boundary of the fanlike sector of the spreading crust is an arcuate zone. This fanlike structure is observed everywhere where modern geodynamic zonality has been investigated. This is true, for example, of Central Asia, the southern part of the West Siberian Platform, and the eastern part of the Russian Platform. All the fans associated with such spreading are characterized by a very definite relationship between the area of the fan (length and diameter of the arc) and focal depth in the arcuate Benioff zone. There is basis for assuming that the dimensions of the fan (and focal depth of earthquakes) are governed by the rate of spreading of the radial zones and accordingly by the rate of rotational shearing movements in the Benioff zone. The fanlike spreading of the crust is manifested most actively in regions of young orogenesis, such as the Pacific Ocean and Mediterranean-Pamir zones, but the phenomenon is also observed in the direction of the Atlantic and Arctic Oceans.
[14]

IV. UPPER ATMOSPHERE AND SPACE RESEARCH

News

POLISH SPACE EXPERIMENTS REVIEWED

Warsaw PRZEGLAD TECHNICZNY-INNOWACJE in Polish No 30, 22-29 Jul 78 pp 32-35

[Article: "Experiments Elaborated by Poland"]

[Excerpts] Taste

The experiment consists in exploring the threshold of the taste perception in a state of weightlessness by an electrometrical method. The aim of the research is to learn the mechanisms responsible for disturbances of taste experienced by astronauts during space flights. So far this mechanism has not been exactly ascertained, although several hypotheses have been advanced. It is conjectured that, among other things, disturbances of taste are caused by the astronaut's food, despite the addition of flavor substances. The disturbances may also be due to a change in the peripheral receptors' sensitivity to the sense of taste, or they are the after-effect of "blood-wave recessiveness," that is, displacement of blood from the lower to the upper part of the human body. The influence of phenomena of a psychological nature are not precluded.

The electrometric method of testing the taste is done by means of irritating with electricity the nerve-endings of the taste buds. It eliminates the difficulties that arise in testing by placing four basic taste substances on the tongue. This method is both exact and quick, also easy to perform, and gives verifiable results. An electric stimulus in the form of a direct current passed by two electrodes (one on the tongue, the other on the wrist) produces a metallic taste for a moment after the current is cut off. In this case an immediate irritation of the taste buds occurs, as well as the production of H^- and OH^+ ions--a result of the electrolysis of fluid in the oral cavity. Since the method of testing with electric current is quantitative, it is possible to determine numerically the threshold values. The electronic taste meter, developed at the Military Institute of Aviation Medicine, enables the astronauts to measure their own taste sensations in conditions of weightlessness. The device consists of a ramp generator that enables alterations in the current voltage between the electrodes (within the range of 0-300 milliampers), as well as a digital gauging system. The values of the current voltage are registered at such a level at which the tested person perceives a sensation of taste.

The doctors' interest in research on the sense of taste results from the importance of these researchers' findings for diagnostic ends. Disturbances of taste sensations accompany many diseases, and their evaluation can contribute not only to ascertaining the proper diagnosis but also at times to deciding on surgical intervention.

Relaxation

In long-lasting space flights, in which among other things sensory deprivation as well as social isolation have an essential effect on the psychophysiological state of the crew, there exists a need for the introduction of special recreational programs. It is recognized that varying the content of visions transmitted by video tapes constitute one of the basic elements in these programs.

The objective of this experiment is:

--determination of the effect of recreational programs on the psychological state of the crew during the performance of space flights on orbital stations of the "Salyut" type.

--the obtaining of information relevant to the effect of this program's varying content on the astronauts' well-being.

Bearing in mind the realization of space flights on orbital stations with international crews, a decision has been arrived upon to elaborate an individual program for every crew with respect to the interest of the individual. In connection with this, surveys of the Polish cosmonauts have been conducted. Their goal was to obtain information relating to: preferred TV programs (serious music, theater programs, popular entertainment, and the like); favorite performing artists, wishes regarding the content of the program (singling out specific works of theater, of amusement, and their performers). Based on the information obtained, a 4-hour program of recorded video-tape has been worked out together with Polish TV. This program has been given to the Soviet Party. After duplicating it on special video-tapes it was included in the general program designated to be used in a manned flight with the participation of the Polish representatives.

The conclusions of the experiment will facilitate the working out of recreational programs, optimal both from the point of view of their content as well as their duration, with respect to individual and collective interests. The significance of these programs in increasing the relaxation value for the space vehicles' crews will also be estimated.

Cardioleader

The experiment consists in monitoring the astronaut's physical exertion during the space flight by indicating the designated stress on the heart and warning when that is exceeded. The objective of the experiment is to explore the

growth of the systole, which depends on the efficiency level. The cardioleader devised at the Military Institute of Aviation Medicine makes it possible to control the astronaut's heart action during the flight. The ventricle QRS wave from the ECG, taken by the use of three electrodes inserted in the astronaut's chest (as published), manipulates the instruments. Each R peak is transformed into a rectangular impulse which controls a meter indicating the frequency of the heart's functioning. The change in the time-lapse between the R peaks causes a proportional voltage change in the system. The voltage on the frequency meter's output is compared with the determined voltages of the comparators that correspond to the upper and lower thresholds of the systole frequency. Exceeding of determined thresholds of the upper and lower systole frequencies causes the release of a sound signal.

The cardioleader has been constructed on the base of linear integrated systems, and thanks to this it is small and modern in conception. It can find a wide range of uses in different areas of astro-medicine.

It is particularly useful for the dosage of physical training under the conditions of weightlessness and during adaptation to earth's gravitation: it conducts the training at constant systole frequency, enabling it to regulate the stress of physical exertion, so that it can create a beneficial training effect.

Health

The experiment consists in measuring and estimating the amount of work done by astronauts during the flight under conditions of controlled equilibrium in the functional state of circulation. The aim of the experiment is to evaluate the astronaut's physical efficiency in the first period after his return to earth.

The methods applied up to now have required large measures of stress, which are not healthy for astronauts. In the health experiment the advantage of using the method developed in the MIAM and of the electrometric apparatus enabling evaluation of the amount of work done has been clear. The principle of measurement consists in application of the feedback between the frequency of action of the heart and the drive distributing doses of physical stress; the functional currents of the heart (ECG) control the measure of the systole frequency. The voltage at the output derived from that system regulates, through an electric monitor, the amount of physical stress which is generated, for example, on the cycloergometer. This makes possible an estimate of the physical efficiency while applying minimal physical stresses, thus enabling the carrying out of research on astronauts immediately after flight. During the application of exertion stresses, the apparatus registers the following parameters: the electrocardiogram, the systole frequency, the automatic measure of arterial blood pressure, the frequency of respiration, the volume of lung ventilation per minute, and the body's internal temperature. The measurement is taken by the use of digital indicators, and the results are recorded on a magnetic tape while the astronauts are on the orbital station under conditions of weightlessness.

TASS ANNOUNCES LAUNCHING OF "COSMOS-1043"

Moscow PRAVDA in Russian 12 Oct 78 p 3

[TASS Report: "'Cosmos-1043'"]

[Abstract] The artificial earth satellite "Cosmos-1043" was launched in the Soviet Union on 10 October 1978. The satellite was inserted into an orbit with the following parameters:
-- initial period, 97.3 minutes;
-- apogee, 650 kilometers;
-- perigee, 625 kilometers;
-- orbital inclination, 81.1 degrees.
[37]

"SALYUT-6" MISSION EVALUATED AFTER ONE YEAR

Moscow IZVESTIYA in Russian 30 Sep 78 p 3

[Article by B. Konovalov: "A Year in Orbit"]

[Text] A year ago, 29 September, marked the beginning of the work watch in space of the orbital scientific station "Salyut-6," exceptionally productive in its results. Work aboard the station is being carried out with an intensity and with a stressed rhythm which has not been known earlier in cosmonautics. Suffice it to mention that during this time there were seven successful dockings with the manned "Soyuz" ships and three with the unmanned "Progress" freighters. The creation of two docking units ensured the successful operation of this "space conveyor belt." During the year of functioning of the "Salyut-6" it was occupied by Yu. Romanenko and G. Grechko, who carried out a record 96-day flight, there were three international expeditions with the participation of cosmonauts from Czechoslovakia, Poland and East Germany, and now V. Kovalenok and A. Ivanchenkov are making history's longest flight.

One of the creators of the "Salyut-6," Professor K. Feoktistov, with whom the journalists conversed at the Flight Control Center, first of all notes the high effectiveness of the work of cosmonauts aboard the orbital station. For example, using the "MKF-6M" camera the cosmonauts took 20,000 photographs in six different spectral ranges in the interests of the most different branches of the national economy.

There was continuous operation of the on-board furnaces "Splav-01" and "Kristall." During the year there were more than 50 meltings using these technological apparatuses; tens of different substances were obtained which it is difficult or impossible to create on the earth.

Objects of exceedingly great interest for scientists and designers are the samples which have long been exposed to the conditions of open space, which A. Ivanchenkov and V. Kovalenok took aboard during emergence into space.

Indeed, usually descent modules are heated during descent in the atmosphere, whereas orbital stations are not returned to the earth, and therefore it has been impossible to study how space acts on different coverings, seals, glass. Now for the first time specialists can do this. Even the first examination of these samples returned to the earth has yielded interesting information. It was found that in space there is a real micrometeor "rain."

Feoktistov states: "It is possible to note what at first glance seems to be a paradoxical situation. The longer the crew lives on the station, the more effectively the crew works. Adaptation to orbital conditions is not only a physiological process. The ability to work effectively aboard a station is developed far more slowly than is required for the body to adapt to weightlessness conditions. The crew gradually learns to live in the station. It adapts the station to itself; the crew members devise very simple devices in order to work more conveniently. For example, Kovalenok and Ivanchenkov, according to the stories of their comrades, those who have visited them, now do not have any free 'walls' -- everywhere on the walls they have hung the ship's documents, different instructions, so that they can be consulted more readily. From food containers and other materials 'at hand' they have devised different kinds of interior decorations and have created 'comfort'."

There has been a substantial change in the nature of the crew's work on board the station since the arrival of the visiting expeditions and the freighters. As a result, it was possible to organize a flow of freight from the earth and there is a possibility of returning, in the course of the work, the results of experiments which they have carried out. To be sure, this complicates the work of the crew but it increases station reliability. A broad possibility appears for carrying out preventive maintenance work, as well as the replacement of individual instruments whose time has run out or which are suspect.

The visiting expeditions make it possible, during the time of a flight, to return to the earth, while the main crew is still in orbit, some samples for a detailed analysis on the earth. In this way physicians obtain blood for detailed investigation. V. Bykovskiy and S. Jaehn returned air samples and samples of bacteriological conditions aboard the station. A careful investigation of the samples indicated that technology is coping with its task, that there were no undesirable impurities in the station atmosphere and that the bacteriological conditions are normal.

The flight, to be sure, gave much for the future. Professor K. Feoktistov feels that on future stations it is necessary to get under way an intensification of automation of investigations, automation of station operation. Man is indispensable in research, adjustment, repair and preventive-maintenance work and it is necessary to free his time for this and everywhere where it is possible, functions can be shifted to the automatic systems. In the opinion of Feoktistov, in the future orbital stations must be outfitted without fail with several docking units. This will broaden the possibilities of the station, will make it possible to use for research the room in transport ships which has been freed of cargo.

Now, during the time of the prolonged flight of V. Kovalenok and A. Ivanchenkov work is continuing on study of one of the central problems in cosmonautics -- clarifying how long man can live in space without sacrifice to his health. This problem can be solved only in one way: gradually, step-by-step, there is an increase in flight duration and a detailed study is being made of the state of the subject's health. The planning of future space flights and even the appearance of space equipment is dependent on a determination of the optimum times for effective work of the cosmonauts.

On the eve of the anniversary of the station the crew had its own personal celebration. On 28 September Aleksandr Ivanchenkov marked his 38th birthday. The cosmonauts noted the birthday by the next series of experiments, carried out using the on-board submillimeter telescope, and also with a holiday dinner.
[17]

COMMENTARY ON THE BENEFITS OF PHYSICAL EXERCISE

Moscow IZVESTIYA in Russian 28 Sep 78 p 3

[Article by B. Konovalov: "The Strong Conquer Space"]

[Text] Vladimir Kovalenok and Aleksandr Ivanchenkov have been in a state of weightlessness longer than any other earthlings. And although there now in the heavens they feel pretty good, they know that a return to what would seem to be ordinary terrestrial conditions will be difficult. And therefore, like any other crew, much attention is being devoted to physical exercises. The cosmonaut must be ready for anything unexpected. For example, only a physically healthy, trained man can bear the overloads which arise during ballistic descent. But a particularly important role is played by physical preparations during prolonged flights.

The "easy life" in a state of weightlessness is dangerous because there is a deconditioning of the muscles and then terrestrial gravity, which you and I usually do not note, is a difficult test for them. The solution for this is one thing -- the muscles must not be allowed to become flabby, to atrophize, and at all times they must be kept in good sports form. For this purpose the cosmonauts during almost the entire work day wear the special "Pingvin" load suits. Wearing them they also usually conduct their television transmissions. Sewn into these suits are elastic strands which sort of bend a man over. If the cosmonaut does not withstand the strength of these strands, the knees would be pulled up to the chest. Counteracting the suit, the cosmonaut is forced at all times to load his muscles. The cosmonauts perform this "exercise" the entire day.

In addition, for two or three hours each day they are busy in their "mini-stadium." On board the station there are two pieces of equipment for exercises -- a complex physical trainer and a bicycle-type ergometer. The basis for the complex trainer is a so-called "treadmill." It is something like an endless belt wound on two cylindrical drums. One of them is supplied with an electric drive and can move this "endless" belt. The cosmonauts, prior to "entry into the stadium," put on special training suits, which are something similar to shorts and a vest. Attached to the belt are rubber strands whose other ends are connected to the floor. The tensional force simulates terrestrial gravity.

The bicycle-type ergometer, the space velocipede, was created specially by specialists of the Plant imeni Likhachyev for use by the cosmonauts. This velocipede has five "speeds" and it is possible to increase the load gradually, beginning with easy, even pedaling, and then gradually sort of start pumping uphill.

The "strolls" on the trainer or the pedaling on the bicycle have little in common with such activity on the earth. The cosmonauts know that this is necessary for them and therefore they engage in such activity with zealousness, although to be sure this is boring. You can agree that a hundred days in a row spinning the pedals for a whole hour and looking at the same wall is not the most delightful of occupations. The crew dreams that someday on orbital stations there will be special videomagnetic recorders for physical exercises. And then the cosmonauts will not simply spin pedals, but in each case will "take a trip" along a new route. And a stroll on the treadmill will be along forest paths, picturesque terrain. There is nothing unrealistic about these dreams. Designers are devoting more and more attention to improvement of comfortable conditions on the station and in the future an orbital station stadium will also probably be supplied with a system for simulating terrestrial conditions.

But for the time being the crew spins the pedals and plans ever-newer projects. Recently in a conversation with Yuriy Romanenko Vladimir Kovalenok expressed the idea of proposing a joint "rationalization proposal": combining the bicycle-type ergometer with a dynamo machine.

"Then our energy will not be spent in vain," says Kovalenok happily, "we will spin the pedals and at the same time we will charge a storage battery." [16]

YELISEYEV COMMENTS ON COURSE OF "SALYUT" MISSION

Moscow PRAVDA in Russian 23 Sep 78 p 3

[Article by A. Yeliseyev, Flight Director, Doctor of Technical Sciences, Twice HSU: "One Hundred Days in Orbit"]

[Text] Vladimir Kovalenok and Aleksandr Ivanchenkov have now been working a hundred days in orbit. If we add the 96 days of activity of the first expedition aboard the "Salyut-6," and the time of station flight in an unmanned

regime, we have a year of continuous operation. World cosmonautics never before has known such examples and we have the right to speak of an experiment which has been carried out for the first time.

In the last analysis, the task of the expedition beyond the earth's limits is to extract the maximum scientific information, the greatest practical advantage. However, this maximum is always limited by the differing resource possibilities.

The station has certain resources: a guaranteed time of reliable operation of its different components; a faultless operation of the great number of instruments cannot be unlimited. The same is true of the amount of fuel, water and food taken aboard.

A number of the limitations are related to the specifics of the flight around the planet. The photographing of the earth, for example, is carried out when the station flies over its illuminated part. And we are interested in very definite regions of the surface. The weather conditions must favor the survey. Such a favorable combination of circumstances does not often occur.

The first international expedition worked aboard the "Salyut-6." Our friends from Czechoslovakia, Poland and East Germany have manifested entirely understandable interest in the observation and photographing of the territories of their countries. The flights have been planned in advance in such a way that this task will be carried out to the fullest degree possible.

Finally, there is still another limitation: the conditions for the work and living of the cosmonauts. The schedule for their life is determined in particular by safety considerations and health. The duration of the work operations and the duration of sleep, the sequence and intensity of physical exercises and the gaps between the taking of meals -- everything must adhere to the schedule. It covers not only each day individually, but also more extensive periods -- a week, a month. For example, there is regular scheduling of complete investigations of the health of the cosmonauts, days of rest are set, etc.

It is clear from what has been said how careful are the preparations for a spaceflight in general and how the number of concerns increase with an increase in the duration of the stay of crews in orbit. After planning an experiment which will be carried out, possibly, a month after the launching, on the way to its implementation it is necessary to overcome a highly complex labyrinth of circumstances which arise. This is like an iceberg -- the main part cannot be seen.

It goes without saying that clear planning does not preclude refinements of the program. Moreover, they are inevitable. The "Salyut-6" has been in orbit for a year. This is not long for ordinary, terrestrial conditions, but space is especially "demanding." The need arises for preventive examinations

of the equipment, repairs, sometimes even replacement of some instruments. Reserve days have been left in the schedule for this purpose.

In general, from the beginning of the first experiment with respect to the number and variety of experiments the planned program has been completely satisfied. The interaction between the "Salyut" station and the "Soyuz" and "Progress" ships occurred in accordance with the noted plans; the preparations for and implementation of the flights accurately coincided with the calculations.

When we speak of space work we are essentially talking about the continuous process of interaction between the crews of orbital complexes and ground services. Two or four men work aboard, but the cosmonauts are simultaneously navigators and testers of new instruments and systems, and geologists and astronomers and biologists...The saturation of the program obligates us with increased sensitivity to react to all the requests of the cosmonauts and to be ready at any moment to supply them with the necessary support and on the first request to give the most competent consultation.

Literally on the next day after the landing of Yuriy Romanenko and Georgiy Grechko the State Commission arrived in order to ascertain how the crew had tolerated the 96-day flight and immediately after its completion of this examination comments and recommendations for the future were heard. There were plenty of them. In agreement with them, the program and work schedule of the "Fotony" included some corrections. For example, the program for Vladimir Kovalenok and Aleksandr Ivanchenkov included an ordinary seven-day work week with two days off (before it was one) and there was an increase in the duration of sleep. Individual sections of the on-board documentation were improved.

In general, it must be said that at the present stage in space research many of the problems with which we have long dealt appear in a new light. There is a rethinking of concepts. A hundred days in orbit is not simply a space flight. This is life in space. There is nothing which can be compared with this singular world of work and living.

When we flew beyond the limits of the planet for several days each action of the cosmonaut was rather rigorously regulated. At that time this was justified. On flights lasting up to several months such a rigorous approach was impossible and not necessary. In my opinion, it was both practical and psychologically feasible to give the cosmonauts a considerable independence in the solution of a number of operational problems.

Let me clarify my thought. Even in one's own apartment, even in the best sanatorium, it is not so easy to spend a hundred or more days behind a closed door. The closed space of an orbital station is still less comfortable and the people there work intensively, and besides that, the boundary between work and day-to-day life is extremely arbitrary. Are physical exercises and medical monitoring day-to-day life or work? Naturally, during

long weeks and months small errors creep in, from which no one is free even on the earth. Something is mislaid, someone forgets to do something in time, something is not put in the right place. A tiny reproach, reminders and instructions given from minute to minute in such cases can cause irritation and lead to a lack of confidence. We treat our comrades who are working in orbit with complete trust and the respect which they rightfully merit due to their self-sacrificing work and unexcelled mastery.

How is the flight of the "Fotony" going? They were internally prepared in advance that it would last so long. That awareness is very important. Kovalenok and Ivanchenkov are working calmly, and I would say, in good spirits. To be sure, such an extended flight requires the mobilization of qualities of the will, the capacity for overcoming the onset of fatigue, the sensation of detachment from home, the ability, as athletes say, "to get their second wind." It seems to me that for the "Fotony" such a moment came somewhere in the middle of their journey: the commander began to sleep less than usual and in the communication between the crew and the earth there were notes of fatigue which slipped through. But everything began to be normalized rapidly and the cosmonauts, as before, made us rejoice at their energy, their good mood, and businesslike attitude.

I would particularly like to note the initiative shown by Vladimir Kovalenok and Aleksandr Ivanchenkov. In the course of a number of preceding expeditions the cosmonauts repeatedly proposed the carrying out of observations and investigations not provided for in the program. The "Fotony" were no exception. But, if you please, before them no one had devoted so much attention to the station itself -- improvement of the interior, creation of additional conveniences for living and work. In actuality, they made it livable, like a home is made livable. Recently Kovalenok and Ivanchenkov in the course of a television report demonstrated some new things. For example, they showed a homemade panel for tools, covers for the protection of control panels, a re-equipped musical corner, and they told how they fabricated a contrivance for the drying of linen. In orbit they feel like at home.

At the time of international space voyages they proved themselves to be excellent and enthusiastic hosts. In the course of prolonged flights aboard the station they established stable norms for living and a clear rhythm of work. The arrival of guests could not but affect this schedule. Aboard the "Salyut-6" first the "Taymyry" and then the "Fotony" took upon themselves an additional load -- the role of caring assistants and attentive advisors. The crews of the main expeditions owed a fraction of their success to our friends from Czechoslovakia, Poland and East Germany.

Valeriy Bykovskiy and Sigmund Jaehn, recently returning from orbit, said that the "Fotony," like experienced tour guides, showed them many highly interesting natural formations on the planet's surface, such formations as are seen only by an experienced observer. And they not only pointed them out, but gave recommendations on a convenient method for investigating them.

Such experience is given by practice which is acquired on long flights. In the course of these flights there is also improvement in skills in the control of ships and stations, the rules and norms for the operation of space vehicles. Proposals are generated which are directed at an improvement of on-board systems and equipment. That is the reason, in particular, why there is an increasing interest in prolonged flights.

Specialists give different evaluations of the optimum time that an expedition should spend in space. I think that an answer to this problem will come with time and experience. As noted by Georgiy Grechko after the return from the "Salyut-6," "it is difficult to live in space, but it is possible to work." In a definite sense we are working on this region between the "difficult" and "possible," to broaden it. The problem is urgent and is also of great importance for the future of cosmonautics. It appears that the era of interplanetary flights is not remote, it is coming, and the results of prolonged orbital expeditions are a step in this direction.

With respect to the practical use and advantage of prolonged flights, the "Fotony" demonstrate it very graphically. For example, using the "Splav" and "Kristall" apparatuses, it was possible to obtain more than 30 different substances whose production under terrestrial conditions involves considerable difficulties, and sometimes such production is completely impossible. However, these substances are necessary for electronics and laser technology. Some of these materials have already been sent out for the fabrication of experimental instruments and devices. During their flight Vladimir Kovalenok and Aleksandr Ivanchenkov managed to take about 3,000 photographs of the earth's surface in six spectral ranges, that is, 18,000 photographs were taken. For an aerial photographic survey of such a scale it would be necessary not only to have an incomparably greater time, but what is more important, it would be necessary to obtain and process 900 times as many frames. What an increase in the effectiveness of work! Incidentally, it can be said that it is necessary to have an accelerated development of ground facilities for processing the collected information in the interests of many branches of the national economy.

The flight of the "Fotony" is continuing and it is still too early to give a final evaluation of what has been done. But already it can be seen clearly: the flight of the "Salyut-6," initiated a year ago, has confirmed that we have all the technical possibilities, means and experience so that in case of necessity it is possible to make manned expeditions virtually without limit. The self-sacrificing work of Vladimir Ivanchenkov, Aleksandr Ivanchenkov and their comrades is assisting in the practical solution of this problem.
[18]

Abstracts of Scientific Articles

CHANGES IN PLASMA PARAMETERS ALONG SATELLITE TRAJECTORIES

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian Vol 16, No 4, 1978 pp 522-526

[Article by I. M. Podgornyy, E. M. Dubinin and Yu. N. Potanin, "New Interpretation of Changes in Plasma Parameters Along the Trajectories of Earth Satellites"]

[Abstract] In laboratory experiments with collisionless and supersonic flow of plasma a study was made of the influence of the vertical component of the magnetic field on the properties of the boundary of the magnetosphere. The article is organized as follows: 1. Southerly field component in the plasma flow. a) Intersection of daytime boundary of the magnetosphere in the low latitudes, b) Intersection of the boundary of the magnetosphere in the high latitudes. 2. Northerly field component in the plasma flow. a) Intersection of the daytime boundary of the magnetosphere in the low latitudes. b) Intersection of the boundary of the magnetosphere in the high latitudes. A number of the examined properties fully agree with modern concepts concerning the structure of the boundary. However, changes in plasma parameters along the earth satellite trajectories sometimes allow a new interpretation, taking into account the formation of a magnetic field eddy on the daytime side and other regularities discovered in the laboratory experiment. [548]

EQUILIBRIUM POSITION OF FIBER ATTACHED TO SATELLITE IN CIRCULAR ORBIT

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian Vol 16, No 4, 1978 pp 621-625

[Article by N. Ye. Bolotina and V. G. Vil'ke, "On the Stability of the Positions of Equilibrium of a Flexible Heavy Fiber Attached to a Satellite in a Circular Orbit"]

[Abstract] Using the Hamilton-Ostrogradskiy variational principle, the authors postulate that there is a flexible nondilatable fiber with a stipulated linear density which is attached to a satellite with a sufficiently great

mass moving in a circular orbit of the radius R in a central gravitational field. It is assumed that the motion of the fiber does not perturb the satellite motions. The study is made with a coordinate system Oxyz with its origin at the attracting center; the system rotates with a constant angular velocity. The Oz axis coincides with the radius connecting the attracting center and the satellite and the Oz axis has the direction of the velocity vector of the satellite in orbital motion. The article examines the position of equilibrium of the fiber. A condition is derived which determines two positions of equilibrium: the fiber is situated along the radius-vector in positive or negative directions. Another condition is derived which is satisfied if the fiber coincides with the satellite orbit, but since the fiber is absolutely flexible, there is an infinite set of configurations corresponding to equilibrium of the fiber. It is shown that there are no other positions of equilibrium. The stability of these positions of equilibrium is examined. The conditions under which the position of equilibrium is stable and unstable are clarified.
[548]

CONTRASTS AND RELIEF PECULIARITIES ON VENUSIAN PANORAMAS

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian Vol 16, No 4, 1978 pp 557-562

[Article by Yu. M. Gektin and A. S. Panfilov, "Statistics of Contrasts and Terrain Relief Peculiarities on Panoramas of the Venusian Surface"]

[Abstract] A statistical study was made of contrasts on the first panoramas of the Venusian surface. The method for processing the images is described in detail. Histograms of the distribution of contrasts were obtained for the "Venera-9" and "Venera-10" panoramas. The authors analyze the difference in the histograms in connection with the structure of the surface, factors exerting an influence on the relief and the age of the rocks at the station landing sites. In the discussion of the reasons for relief differences, it is noted that many relief-forming factors are absent, such as: erosional, dissolving and accumulative activity of water, snow and ice, frost weathering and influence of a biosphere. With such a dense atmosphere as on Venus it is also possible to discard the direct effect of solar radiation and bombardment by micrometeorites. The rates of atmospheric movements near the surface indicate that eolian destruction must be very insignificant. Therefore, the emphasis in this study is on chemical destruction. The rates of chemical erosion are evaluated. The nature of relief in the area of the landing of the "Venera-9" is indicative of its relative youth.
[548]

MIDDLE-LATITUDE TROUGH IN H^+ CONCENTRATION AND POSITION OF PLASMOPAUSE

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian Vol 16, No 4, 1978 pp 632-635

[Article by L. D. Sivtseva and V. A. Yershova, "Relative Position of the Trough in the H^+ Concentration and Plasmopause According to Data from the 'Oreol-2' Satellite"]

[Abstract] The middle-latitude trough in the distribution of the concentration of light hydrogen and helium ions is a highly important phenomenon in the subauroral ionosphere. However, the problem of the decisive mechanisms in formation of the trough remains open. This paper examines the relative position of the middle-latitude trough in the concentration of hydrogen ions and the projection of the plasmopause on ionospheric altitudes on the basis of data from the "Oreol-2" satellite. The data presented here make it possible to conclude that at least during the time of magnetic storms the losses of H^+ ions in the subauroral trough at the altitudes of the upper F-layer in the evening sector begin deep within the plasmosphere. The process of formation of the middle-latitude trough in the concentrations of light ions, constituting in essence an unidentified mechanism of nonthermal dissipation, must apparently be considered within the framework of formulation of a theory of phenomena in the outer plasmosphere associated with the dynamics of the ring current and including an intensification of the phenomena of nonthermal dissipation under conditions of heating of ions in the outer plasmosphere.
[548]

OPTIMIZING THE REGIME OF SOLAR ENERGY CONVERTERS

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 7, 1978 pp 53-60

[Article by Yu. V. Mitrishkin, "Optimizing the Regime of Solar Energy Converters"]

[Abstract] The article discusses the automatic optimizing of the operating regime for a solar energy converter in autonomous electric power systems. The author describes the process of search for the maximum power taken from the converter using a pulsed automatic optimizer. The structure and functioning of the optimizer is described in detail. A d-c voltage converter with a parallel switch is used in the power part of the optimizer. The optimizer, which is described in detail, ensures the transmission to the storage battery and the load the maximum power generated by the primary converter. The process of search for the power maximum is described.
[565]

IONOSPHERIC RADIO WAVE ABSORPTION DURING SOLAR ECLIPSE

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 18, No 4, 1978 pp 737-739

[Article by M. Shirmammedov and D. Boltayev, Physical-Technical Institute Turkmen Academy of Sciences, "Ionospheric Absorption of Radio Waves During the Annular Solar Eclipse of 29 April 1976"]

[Abstract] During the time of a solar eclipse the ionized layers of the upper atmosphere experience considerable changes. As a result of absence or decrease in the flux of solar ionizing radiation, at the time of the eclipse there is an appreciable deviation of the diurnal variation of ionization in the direction of its decrease. This phenomenon was studied in the example of the the annular solar eclipse of 29 April 1976 at Ashkhabad, with a determination of its influence on the temporal variation of ionospheric parameters. On the control days 27 and 28 April the A1 method was used in making hourly measurements of absorption during the daytime at three fixed frequencies, 1.8, 2.2 and 2.6 MHz, with the duration of the observations at each frequency being 5 minutes. Registry of field strength on the control days and on the day of the eclipse was accomplished simultaneously at two frequencies -- 12.007 MHz on the path Moscow-Ashkhabad with a length of 2,500 km and 5.935 on the path Tashkent-Ashkhabad with an extent of 1,040 km. Registry was every hour, the duration of the session being 15 minutes, but beginning at 1315 hours and through 1815 hours the registry was continuous. On these days the ionospheric station operated on a quite frequent schedule, and during the period of the eclipse -- continuously, which made it possible to evaluate the general state of the atmosphere. The data presented here show a distinct effect from the solar eclipse; this is illustrated graphically. It is noted that the interpretation of such phenomena is associated with definite difficulties primarily due to the relatively poor study of the D region, where the strongest absorption of radio waves in the considered range occurs.
[555]

MAGNETIC FIELD EFFECT ON DISSIPATION OF IONOSPHERIC INHOMOGENEITIES

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 18, No 4, 1978 pp 619-626

[Article by N. D. Filipp and N. Sh. Blaunshteyn, Bel'tskiy State Pedagogic Institute, "Influence of the Earth's Magnetic Field on the Dissipation of Ionospheric Inhomogeneities"]

[Abstract] The problem of the influence of the magnetic field on the dissipation of ionospheric plasma inhomogeneities has recently been studied in a number of theoretical works (A. V. Gurevich, et al., USPEKHI FIZ. NAUK, 91, 609, 1967; T. R. Kaiser, et al., PLANET. SPACE SCI., 17, 519, 1969.)

In the first study there was a detailed examination of the case of weakly ionized inhomogeneities and to a lesser degree, strongly ionized inhomogeneities. In the second study, on the assumption of poorly ionized plasma, a study was made of the processes of diffusion of plane-layered and cylindrical inhomogeneities. There was found to be a strong dependence of the diffusion process on the degree of orientation of inhomogeneities relative to the magnetic field direction. However, in recent experimental studies on investigation of the processes of dissipation of meteor trails the authors doubt the critical dependence of the coefficient of ambipolar diffusion on the angle between the axis of the homogeneity and the magnetic field lines of force. The purpose of this new paper is an investigation of the nature of the influence of the magnetic field on the diffusion of anisotropic inhomogeneities in the lower ionosphere, taking into account their real degree of ionization and an evaluation of the applicability of the Gurevich and Kaiser theories in real cases. The formations considered are localized at altitudes 90-120 km. The results of the experiment agree with the Gurevich theory, taking into account the real parameters of ionization of meteor trails. Both theories in the case of weakly ionized plasma inhomogeneities predict a strong dependence of the coefficient of ambipolar diffusion on the angle between the axis of the inhomogeneity and the magnetic lines of force. However, the Kaiser theory unsatisfactorily predicts the duration of dissipation of weakly ionized inhomogeneities giving rise to quasicontinuous signals.
[555]

METHOD FOR ESTIMATING INTENSITY OF SOLAR PROTONS

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 18, No 4, 1978 pp 577-582

[Article by S. T. Akin'yan, V. V. Fomichev and I. M. Chertok, Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation, "Evaluations of the Intensity of Solar Protons from the Integral Parameters of Microwave Radio Bursts"]

[Abstract] The authors examine the quantitative diagnosis of proton flares on the basis of data on the integral parameters of radio bursts at frequencies of 3 and 9 GHz. In particular, two parameters are analyzed: the total burst flux P_f and the integral flux of the increase phase R_f at a definite frequency f. The P_f parameter is the integral of the intensity of radioemission for the entire time profile of the burst and the R_f parameter is equal to the total area of the sectors of the time profile in which the intensity of the time derivative is positive. In contrast to the maximum burst intensity, the integral parameters P_f and R_f reflect the development of the flare with time and contain definite information on flare energy. The P_f parameter characterizes the total energy of the radio burst at a particular frequency, whereas the R_f parameter corresponds to the energy released in the phase of acceleration of particles in the flare.

It is shown that by the method described in this paper it is possible to clarify the influence of a series of general effects which are associated with the influence of the heliolongitudes of flares, the conditions for the escape of particles into interplanetary space, and also the nature of the spectrum of particles accelerated in a flare. The use of data on radio bursts, especially data on the intensity and dynamic spectrum of the meter component, and also on the peculiarities of the spectrum of microwave radio emission, makes it possible to take these effects into account to a definite degree.
[555]

NIGHTTIME "EQUATORIAL RING" IN F REGION IONOSPHERE

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 242, No 4, 1978 pp 796-799

[Article by G. M. Grechko, G. M. Nikol'skiy, Yu. V. Romanenko, S. A. Savchenko and A. I. Simonov, Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation, "Nighttime 'Equatorial Ring' in the Ionospheric F Region"]

[Abstract] The "Salyut-6" orbital station crew visually discovered a nighttime diffuse glow localized at altitudes of 8-9°. The brightness of this glow attained the brightness of the Milky Way and the zodiacal light; the vertical extent was 2-3°. In azimuth the glow sometimes occupied the entire visible horizon. This phenomenon was not always observed and its brightness was dependent on the time and place of observations. An analysis makes clear that the glow is a rather compact formation in the form of an inhomogeneous "ring" located in the region of the geomagnetic equator. The flight time during which the glow occupied 360° in azimuth usually did not exceed one minute. It therefore can be concluded that the extent of the glow region along the direction of the orbital station is $\leqslant 10°$. Fifteen photographs show the "ring" in addition to the well-known glow at about 100 km [the "ring" is also known as the "second layer"]. Visual observations were made through interference filters. Through the red filter it was not possible to see the emission, this being associated with the low response of the eye to low intensities of red light (by a factor of less than 100 in comparison with green). Through the green filter there was an intensification of the emission with a definite inclination of the filter approximately corresponding to the green line [OI]. Intensification of this emission in the "equatorial ring" can be related to two factors: an increase in the electron concentration or an increase in the kinetic temperature in its region. The latter possibility, with any [OI] excitation mechanism (electron collision, dissociative reactions), leads to an increase in the emission.
[36]

VI. MISCELLANEOUS

News

"KOSMONAVT DOBROVOL'SKIY" BEGINS FIRST OCEAN CRUISE

Leningrad LENINGRADSKAYA PRAVDA in Russian 14 Oct 78 p 4

[Article by A. Arzhanov: "On Board -- the Name of a Hero"]

[Summary] The "Kosmonavt Georgiy Dobrovol'skiy," the third in the series of ships comprising the USSR Academy of Sciences' space fleet, has begun its first ocean cruise. The ship will receive scientific and telemetric information from satellites, transport ships and orbital and interplanetary stations, transmitting it to the Flight Control Center after analysis and coding.

In the meantime, the fourth ship to be designed specifically for servicing various space missions is under construction. It will join the fleet this winter. [5]

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